PATENT
PDNO 10992021-1

MULTI DYNODE DEVICE AND HYBRID DETECTOR APPARATUS FOR MASS SPECTROMETRY

ABSTRACT OF THE INVENTION

A multi dynode device (MDD) for electron multiplication and detection and a hybrid detector using the MDD have high peak signal output currents and large dynamic range while preserving the time-dependent information of the input event and avoiding the generation of significant distortions or artifacts on the output signal. The MDD and hybrid detector overcome saturation problems observed in conventional hybrid detectors by providing a unique electron multiplier portion that avoids the path-length differences. The MDD and hybrid detector can be used in mass spectrometry, in particular, time-of-flight mass spectrometry. The MDD comprises a plurality of dynode plates arranged in a stacked configuration. Each dynode plate in the stack has a plurality of apertures for cascading secondary electrons through the stack. Each aperture comprises a mechanical bias or offset with respect to the apertures in adjacent plates. The offset is such that the electrons will impact with one or more of the dynode plates. The MDD further comprises a power source to provide a voltage bias to the dynode plates. The power source comprises a voltage supply and a voltage divider. Each dynode plate is connected to a tap on the voltage divider such that a voltage gradient is produced along the stack. The MDD can supply high peak currents. The hybrid detector comprises an input portion having a microchannel plate MCP and an output portion having the multi dynode device (MDD). The MCP and MDD are adjacent to one another. The MDD is planar, flat, and compact like that of the MCP, such that important temporal integrity of an input signal event is preserved.